In the twenty-five years that elapsed between surveys conducted in 1971–1974 and in 1999–2000, the prevalence of obesity rose from 5 percent to 10.4 percent among two-to-five-year-olds; from 4 percent to 15.3 percent among six-to-eleven-year-olds; and from 6.1 percent to 15.5 percent among twelve-to-nineteen-year-olds.1,2

Economic Factors And Childhood Obesity

Childhood obesity is a complex, multidisciplinary issue, so the search for solutions requires information sharing across many fields. To promote such exchange, this paper describes research findings from the field of economics. Relative to other disciplines, economics has only recently been applied to the study of obesity. As a result, there are many useful applications yet to be made.

Economics offers several useful tools for the study of childhood obesity: insights into the economic causes and consequences of obesity, clearly defined rationales for government intervention in markets, and the use of cost-effectiveness analysis for comparing policies to prevent or reduce obesity. This paper summarizes recent research in each of those areas. It concludes by discussing the implications for health policy.

Economic explanations for the recent rise in obesity tend to focus on changes that give people incentives to consume more or to burn fewer calories. These include the following.

FOOD PRICES The real price of food (the price of food adjusted for inflation across all goods and services) has declined greatly in recent decades. For example, between 1990 and 2007 the real price of a two-liter bottle of Coca-Cola fell 34.89 percent, and that of a McDonald’s quarter-pounder with cheese fell 5.44 percent.3 Some research indicates that reductions in the price of food account for 41–43 percent of the rise in young adults’ body mass index (BMI) between 1981 and 1994.4

BMI is most sensitive to the price of fast food in particular for youth from families of low socioeconomic status.5 The real price of fruit and vegetables rose 17 percent between 1997 and 2003,6 an increase that some studies have linked to higher BMI in American children and adolescents.7,8

AGRICULTURAL POLICIES The decline in the price of food could be due to agriculture policies. However, several studies have concluded that such policies have little impact on consumer prices of energy-dense foods.9,10 About half of farm subsidies are based on historic, not current, production, which limits incentives for farmers to increase output.9 Moreover, U.S. farm policy raises...
the prices of sugar (by restricting imports) and milk (through regional dairy compacts).

In addition, the impact of farm policy on many retail food prices is modest because the cost of farm products (ingredients) represents a small proportion of the food’s retail price. For example, the cost of corn—the key ingredient in high-fructose corn syrup—contributes just 1.6 percent to the price of soft drinks. It is estimated that agriculture subsidies, by decreasing the prices of food, raise the BMI of youth by 0.08 percent, or a fraction of a pound.

Subsidizing the production of corn and restricting imports of sugar have given food manufacturers, particularly the producers of soft drinks, an incentive to substitute high-fructose corn syrup for sugar. Some researchers have argued that this shift contributes to increased food intake and obesity because fructose, unlike the glucose in sugar, does not stimulate insulin secretion or leptin production, both of which regulate food intake. However, the link between high-fructose corn syrup and obesity remains controversial.

Another way in which agriculture policy contributes to increased food consumption and thus obesity is that the U.S. government requires producers of agricultural commodities that enjoy price supports to contribute a specific amount of money for each unit they sell into a fund that is used for commodity-specific advertising and research. Among other things, these funds are used to support the advertising of fast-food menu items, which in turn raises the risk of youth obesity.

**Income** Income is another potential contributor to obesity. Higher income could prevent weight gain by enabling consumers to substitute healthier, more costly food for cheaper energy-dense food or by increasing demand for good health or an attractive appearance. On the other hand, additional income could promote weight gain by allowing people to consume more calories and spend more time in sedentary pursuits. These conflicting effects may explain why research so far has found little or no evidence that income affects BMI or the likelihood of becoming overweight or obese.

A direction for future research is to determine whether these negligible or zero effects on weight are the result of negligible changes in diet and physical activity, or whether there are substantial changes that happen to cancel each other out (for example, that calorie consumption and exercise both increase, with no net change in weight).

Although conventional wisdom seems to be that the poor are more likely to be obese, the extensive literature on socioeconomic status and obesity includes widely varying findings. For example, one recent study finds that the correlation between childhood obesity and the income of the household varies considerably by race, sex, age, and year. The study also found a negative correlation between childhood obesity and income for white girls only.

**Maternal Employment** Maternal employment may contribute to childhood obesity. It is estimated that the increase in a mother’s average weekly work hours explains 11.8–34.6 percent of the rise in childhood obesity in high-socioeconomic-status families between 1975 and 1994. A subsequent study found an association between maternal employment and childhood obesity only for children whose mothers were employed full time when the child was seven years old. This association was not found for children whose mothers worked full time when the child was either preschool age or age eleven, or for children whose mothers worked part time when the child was any of these ages.

Children with working mothers watch more television than children whose mothers do not work outside the home. In addition, working mothers spend less time cooking and eating with their children than mothers who do not work outside the home, which increases the probability that the family will consume prepared foods. These decreases in time spent cooking and eating with children are only slightly offset by increases in time spent at such activities by husbands or partners.

Child care arrangements for the offspring of working mothers have also been correlated with an increased risk of childhood obesity. Children in center-based care are more likely to be obese than children cared for by nonparental relatives or by a nanny. This may be attributable to differences across the environments in the quality of children’s diet.

**Technology** Another economic explanation for the rise in obesity is changes in technology. A technological revolution in mass preparation and preservation of food has made it easier for Americans to eat more in less time.

**Patience** Some researchers suspect that people are becoming more willing to exchange their future health for immediate gratification. This theory would seem to indicate that people who are obese also should be more likely to indulge in risky behavior such as smoking and drink-
ing alcoholic beverages, but research has not borne that out. Studies find only about a 10 percent correlation among these behaviors.28

Economic Consequences Of Childhood Obesity
The economic consequences of childhood obesity are typically categorized as direct, such as medical costs, and indirect, such as job absenteeism. The direct costs of childhood obesity include annual prescription drug, emergency room, and outpatient costs of $14.1 billion,29 plus inpatient costs of $237.6 million.30 An even larger cost is incurred when obese children become obese adults. About a third of obese preschool children, and about half of obese school-age children, become obese adults.31 The estimated annual cost of treating obesity-related illness in adults is $147 billion.32 The medical costs of obesity are so substantial that the rise in obesity explains 27 percent of the rise in health care spending between 1987 and 2001.33 A limitation of this research is that obesity may be correlated with unobservable factors that directly affect medical costs; for example, a person may have sustained a disabling injury that leads to obesity as well as raises medical costs.

The indirect costs of obesity include labor-market costs to the obese individual and potentially the employer. Obesity is associated with delayed skill acquisition in children as young as two to three years old.34 Even when education and cognitive ability are controlled for, adult obesity is associated with lower wages, especially for white females.35 In addition, obesity-related job absenteeism totals $4.3 billion annually.36 Also, obesity is associated with lower productivity while at work (presenteeism), which totals $506 per obese worker per year.37

Economic Rationales For Government Intervention
One economic rationale for government intervention is to internalize external costs, which means to ensure that all of the costs associated with obesity are borne by those whose decisions create the costs. In 2008 obesity-related illness cost Medicare $19.7 billion and Medicaid, $8 billion.38 These costs were borne by the general population, whose tax dollars fund these federal and state health insurance programs. In addition, private health insurance plans paid $49 billion to treat obesity-related illness in 2008.32 Some of this cost also was borne by the nonobese in the form of higher group health insurance premiums.

The indirect costs of obesity include labor-market costs to the obese individual and potentially the employer.

The government could tax obesity itself (which would presumably be politically unpopular), or tax the behavior that contributes to obesity and subsidize behavior that contributes to healthy weight.

Another government intervention that might be useful is to provide consumers with more information about the food they eat. Recently, cities such as New York have required fast-food chain restaurants to list the calorie content of their food on menus and menu boards.38 It is not yet clear whether such menu labeling affects food choices and, ultimately, obesity.

More is known about the effects of the Nutrition Facts panel, which has been required on packaged foods since 1994. Since the Nutrition Facts panel was introduced, Americans have increased consumption of iron and fiber, although they have not lowered consumption of total fat, saturated fat, or cholesterol.39 Obesity prevalence among white females who use the labels when shopping is 2.67 percentage points lower than it would have been in the absence of the labels (no significant effect of the labels on weight was found for other demographic groups).40

Another economic rationale for government intervention in markets is to protect consumers who are acting irrationally. This criterion should be used cautiously, because irrationality is in the eye of the beholder.

However, children arguably are not able to take into account the future consequences of their actions, and children as old as age eleven may fail to appreciate the difference between television advertisements and television programming.41 As a result, some European countries have banned food companies from advertising to children.41 It is estimated that a ban on television fast-food advertising to children in the United States would reduce the prevalence of overweight by 18 percent among children ages 3–11 and by 14 percent among youths ages 12–
However, it is difficult to accurately measure the effect of food ads on weight because exposure to the ads is correlated with sedentary lifestyle and other factors that contribute to obesity.

**Making Interventions Cost-Effective**

To get the biggest “bang for the buck” in preventing childhood obesity, decision makers can use cost-effectiveness analysis, which compares interventions in terms of their cost per quality-adjusted life-year (QALY) saved. Exhibit 1 lists some of the available data on the cost-effectiveness of anti-obesity interventions.

Based on the published literature, the most cost-effective way to prevent obesity in youth is the Coordinated Approach to Child Health (CATCH), a comprehensive intervention to promote healthy eating and physical activity in elementary schools, which costs $900 per QALY saved. The next most cost-effective program is Planet Health, a comprehensive intervention to promote healthy eating and physical activity in middle schools, which costs $4,305 per QALY saved for girls but is not effective for boys.

The adage that “prevention is cheaper than cure” is true in this case. Treating adult obesity with the drug orlistat costs $8,327 per QALY, the drug sibutramine costs $9,299 per QALY. Gastric bypass surgery costs $5,000–$16,100 per QALY for women and $10,000–$35,600 per QALY for men. Wheeling Walks, a behavior modification program targeted to sedentary adults, costs $14,286 per QALY; other behavior modification programs for adults cost much more per QALY saved.

Of course, not every prevention strategy is more cost-effective than every treatment. For example, the Moving School Bus program, which encourages children to walk rather than ride to school, is neither effective nor cost-effective.

Limitations of these cost-effectiveness analyses include many uncertainties, such as how effectively participants maintain weight loss over time.

**Financing A Fight Against Obesity**

Public opinion polls indicate that most Americans consider childhood obesity to be a major public health problem. In a 2008 nationwide survey, obesity was ranked as the number-one health problem for children.

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**EXHIBIT 1**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Description</th>
<th>Estimated cost per QALY saved</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Youth</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coordinated Approach to Child Health (CATCH)</td>
<td>Comprehensive intervention in elementary schools</td>
<td>$900</td>
<td>Brown et al. (2007)</td>
</tr>
<tr>
<td>Planet Health</td>
<td>Comprehensive intervention in middle schools</td>
<td>$4,305 for females, not effective for males</td>
<td>Wang et al. (2003)</td>
</tr>
<tr>
<td>Moving School Bus</td>
<td>Adults walk set routes to facilitate children’s walking rather than riding to school</td>
<td>Not effective</td>
<td>Moodie et al. (2009)</td>
</tr>
<tr>
<td><strong>Adults</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xenical (orlistat)</td>
<td>Anti-obesity drug that inhibits absorption of, and promotes excretion of, dietary fat</td>
<td>$8,327</td>
<td>Maetzel et al. (2003)</td>
</tr>
<tr>
<td>Meridia (sibutramine)</td>
<td>Anti-obesity drug that suppresses the appetite</td>
<td>$9,299</td>
<td>Warren et al. (2004)</td>
</tr>
<tr>
<td>Wheeling Walks</td>
<td>Communitywide campaign using paid media to encourage walking among sedentary adults</td>
<td>$14,286</td>
<td>Roux et al. (2008)</td>
</tr>
<tr>
<td>Gastric bypass surgery</td>
<td>Limits food intake by reducing the effective size of the stomach and bypassing part of the small intestine</td>
<td>$5,000–$16,100 for women, $10,000–$35,600 for men</td>
<td>Craig and Tseng (2002)</td>
</tr>
<tr>
<td>Social support to promote walking</td>
<td>Provision of maps, handouts on strategies for social support of walking, frequent calls to prompt participants to walk</td>
<td>$27,373</td>
<td>Roux et al. (2008)</td>
</tr>
</tbody>
</table>

**SOURCES** Various Notes in text.
However, polls may be misleading indicators of taxpayers’ “willingness to pay” higher taxes for obesity prevention programs. So-called contingent valuation survey methods, which are used to estimate the value of goods not traded in markets, indicate that although 83 percent of New York State residents agree that childhood obesity is a major problem, more than a third refuse to pay even $10 a year in higher taxes to cut childhood obesity in half. Collectively, however, society is willing to pay substantial amounts to reduce childhood obesity. The mean willingness to pay for a 50 percent reduction in childhood obesity in New York State was $46.41, which implies a total willingness to pay by New York State residents of $690.6 million.

The level of public support for anti-obesity policies is greatly influenced by how the issue of costs is framed. The 2009 Empire State Poll of New York State residents asked respondents whether they agree with improving the nutrition of food in school cafeterias (Exhibit 2) and increasing the quantity and quality of physical education in schools (Exhibit 3). For each of these policies, respondents were randomly asked one of three versions of a question that varied in how explicitly costs of the policy were discussed.

Exhibit 2 shows that if no mention is made of costs, 92.1 percent agree and only 4.4 percent disagree with improving the nutrition of food in school cafeterias. If the question is modified to end “even if it requires raising taxes,” agreement falls to 69.5 percent and disagreement quintuples, to 22.6 percent. If the question begins with a discussion of costs by saying “The government should raise taxes in order to improve the nutrition of food in school cafeterias,” only 40.5 percent agree and 53.2 percent disagree. Each of these differences is statistically significant ($p < 0.01$). Thus, how the issue of costs is framed can cut support by more than half, from 92.1 percent to 40.5 percent, and can increase opposition twelvefold, from 4.4 percent to 53.2 percent.

Similar patterns are shown in Exhibit 3 for questions about increasing the quantity and quality of physical education in schools. Clearly, there is a need for caution when using poll results to gauge public support for specific policies—support may be highly sensitive to how questions are worded, especially with regard to costs.

### Childhood Obesity: A Policy Agenda

Inevitably, government efforts to prevent and reduce childhood obesity will have limited budgets. To maximize the benefit to society, it is necessary to spend that limited budget on the anti-obesity interventions that are most cost-effective.

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**EXHIBIT 2**

How The Framing Of Costs Influences Public Support For Improving The Nutrition Of School Food

<table>
<thead>
<tr>
<th>Question wording</th>
<th>Strongly agree or agree (%)</th>
<th>Strongly disagree or disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The government should improve the nutrition of food in school cafeterias</td>
<td>92.1</td>
<td>4.4</td>
</tr>
<tr>
<td>The government should improve the nutrition of food in school cafeteras, even if it requires raising taxes</td>
<td>69.5</td>
<td>22.6</td>
</tr>
<tr>
<td>The government should raise taxes in order to improve the nutrition of food in school cafeterias</td>
<td>40.5</td>
<td>53.2</td>
</tr>
</tbody>
</table>

**SOURCE** Author’s calculations, using data from the 2009 Empire State Poll. **NOTES** The 2009 Empire State Poll (ESP) of 800 respondents was conducted 30 January–16 March 2009. Respondents were selected using the random-digit-dial method, and the interview was conducted using a computer-assisted telephone interviewing software system. The random sampling frame allows poll results to be generalized to the entire state of New York. Percentages do not add to 100 because respondents also had the option of answering that they were “neutral,” answering “don’t know,” or refusing to answer. In the second and third rows, the portion of the question that is underlined indicates the part of the question that differs from the wording in the first row. It does not indicate that the interviewer emphasized those words when asking the question. The difference in values across rows within a column is statistically significant ($p < 0.01$) in each case.
**SET PRIORITIES** For example, the school-based program CATCH is highly cost-effective.44 The wide variations in cost-effectiveness shown in Exhibit 1 underscore the importance of prioritizing interventions with the lowest cost per QALY, to avoid wasting resources. Unfortunately, cost-effectiveness studies have not yet been conducted for many promising interventions. Research is, in many cases, at the earlier stage of determining whether the intervention is effective at all. The National Institutes of Health (NIH) should continue to invest in cost-effectiveness studies of anti-obesity interventions, to better inform funding decisions and ensure that the limited funds allocated to obesity prevention and treatment yield the maximum improvement in public health.

**ENACT INSURANCE MANDATES** Governments can mandate that private health insurance plans cover cost-effective methods of preventing and treating childhood obesity.55 These policies may not be covered in the absence of a mandate because high turnover of enrollees implies that it is profit-maximizing for health insurance companies to refuse to reimburse for prevention and treatment that do not generate short-term savings. As a result, many health insurance plans do not reimburse doctors for preventing and treating youth obesity.56

**EMPHASIZE PREVENTION** In addition, public health insurance programs should cover cost-effective methods of prevention and treatment. West Virginia and Pennsylvania have been innovators in addressing obesity by expanding Medicaid coverage—for example, for nutrition education.57 A handful of states are incorporating incentives for healthy behavior into their Medicaid and Children’s Health Insurance Programs (CHIP). Such states have been both praised for encouraging healthy behavior and criticized for placing the health of low-income children at risk by linking the provision of services to parents’ behavior.58

**USE INCENTIVES** The external costs of obesity provide a rationale for taxes and subsidies to promote healthy eating. Experiments have established that altering food prices can change youth behavior. Cutting the prices of fruit, salad, and carrots in high school cafeterias in half resulted in a quadrupling of sales of fruit and a doubling of sales of baby carrots, although it did not significantly affect sales of salads.59 Other experiments with vending machines in high schools found that the quantity and type of snacks purchased were significantly affected by price.59 A limitation of these studies is that they do not track consumption in all places and at all times. Also, it remains unclear whether total caloric intake rises or falls when low-calorie foods are subsidized in schools.

A challenge for food taxes is defining the scope of what should be taxed and what should be subsidized. Should apple juice be taxed because it is energy-dense, or should it be subsidized because it is 100 percent fruit and sometimes contains added vitamins? Prominent public health advocates have recently called for taxes on full-calorie soda.60 The mean published estimate is that a 1 percent increase in soda price would reduce the quantity of soda demanded by 0.79 percent.61 The modest soft drink taxes that currently exist appear to have negligible effect on body weight.62 A challenge for estimating the impact on obesity of a substantial soft drink tax is that no such taxes currently exist.

A risk of taxing a narrow set of energy-dense foods (such as soda) is that consumers may “substitute away” from the taxed items toward energy-dense items that are not taxed. Another challenge is that food taxes can be regressive, falling more heavily on the poor. Several states that tax food, including Hawaii, Idaho, Kansas, Oklahoma, South Dakota, and Wyoming, both tax food and provide an income tax credit or rebate to low-income households that compensates them for the loss of their purchasing power.63

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**EXHIBIT 3**

How The Framing Of Costs Influences Public Support for Improving Physical Education In Schools

<table>
<thead>
<tr>
<th>Question wording</th>
<th>Strongly agree or agree (%)</th>
<th>Strongly disagree or disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The government should increase the quality and quantity of physical education in schools</td>
<td>86.2</td>
<td>9.7</td>
</tr>
<tr>
<td>The government should increase the quality and quantity of physical education in schools, even if it requires raising taxes</td>
<td>59.9</td>
<td>33.9</td>
</tr>
<tr>
<td>The government should raise taxes in order to increase the quality and quantity of physical education in schools</td>
<td>37.5</td>
<td>55.8</td>
</tr>
</tbody>
</table>

**SOURCE** Author’s calculations, using data from the 2009 Empire State Poll. **NOTES:** See Exhibit 2

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Conclusion

Obesity is a major public health problem facing the United States, with significant consequences for health care costs and productivity. Incorporating the economic perspective into obesity research and policy can help identify contributors to obesity, calculate the consequences of obesity, and allocate scarce resources to the interventions that offer the greatest benefit per dollar of cost.

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